Learning objectives for lectures in EAS 199B Midterm Break Winter 2013

1 Introduction, Overview of Fish Tank Project, Fabrication of PVC Tank
- Understand the broad goals of the fish tank project
- Understand the goals and expectations of the class
- Be able to complete the fabrication of the PVC fish tank

2 Introduction, Overview of Fish Tank Project, Fabrication of Platform
- Be able to safely and effectively use hand tools to assemble the wooden platform for the fish tank project

3 Fabrication of Salinity Sensor, Introduction to MATLAB
- Be able to safely and effectively use hand tools to assemble the salinity sensor
- Be prepared to assemble the flow loop for the fish tank
  Be able to launch MATLAB in the engineering computer lab
- Be able to plot simple data sets with MATLAB

4 Fabrication of flow loop; Prepare for calibration of the salinity sensor
- Be able to safely and effectively use hand tools to assemble the flow loop
- Be able to verify that the flow loop is operating with tap water
- Be able to describe the electrochemical reactions responsibility for the change in electrical conductivity with salt concentration

6 Prepare for calibration of the Salinity Sensor
- Be able to demonstrate a working flow loop for the fish tank
- Be able to demonstrate reading of the signal from your conductivity sensor
- Be able to describe the calibration procedure for the conductivity sensor
- Be able to compute the mean, median, and standard deviation of a data set

7 Calibration of the Salinity Sensor and fabrication of wiring harness for the LCD
- Be able to set up the electrical circuit to power the conductivity sensor
- Be able to demonstrate reading of the signal from your conductivity sensor
- Be able to compute the mean, median, and standard deviation of a data set
- Be able to perform the calibration procedure for the conductivity sensor
- Be able to fabricate the wiring harness for the LCD panel

8 Calibration of the Salinity Sensor and fabrication of wiring harness for the LCD
- Be able to set up the electrical circuit to power the conductivity sensor
- Be able to demonstrate reading of the signal from your conductivity sensor
- Be able to compute the mean, median, and standard deviation of a data set
- Be able to perform the calibration procedure for the conductivity sensor
- Be able to fabricate the wiring harness for the LCD panel

9 Analysis of mass balance for batch processes; Circuits for solenoid actuation; Installation of solenoid valves on the fish tank.

- Be able to identify whether a process is batch, steady flow or unsteady flow.
- Be able to write the mass balance equations for batch processes.
- Be able to use a systematic procedure to solve batch mass balance problems.
- Be able to identify the components in a cascade control circuit
- Be able to describe the purpose of the flyback diode on a relay coil or solenoid valve.
- Be able to attach the solenoid valves and supply tanks to the fish tank platform

10 Analysis of mass balance for batch processes; Circuits for solenoid actuation; Installation of solenoid valves on the fish tank.

- Be able to use a systematic procedure to solve batch mass balance problems.
- Be able to explain the sequence of events that occur when a relay coil is powered
- Be able to identify the different types of relays (SPST, SPDT, DPST, and DPDT) and explain their operation
- Be able to describe the difference between the relay used in the fish tank, and the relay that comes with the Sparkfun Inventor's Kit
- Be able to assemble the cascade switching circuit for solenoid valves on the fish tank platform

11 Preparation for salinity control.

- Be able to describe the role of UCL and LCL in the control algorithms.
- Be able to describe how to compute UCL and LCL
- Be able to describe and distinguish the terms, setpoint, deadband and deadtime
- Be able to describe a procedure for measuring deadtime
- Be able to describe what variables are involved in determining the proportional control response
- Be able to explain why the full proportional control response is not used, and how the actual control response is computed

12 Preparation for salinity control.

- Be able to derive and use the equations for mass balance during salinity control of the fish tank
- Be able to implement the salinity control algorithm